

REMARKS

Introduction

Claims 1-46 are pending in this application. Claims 1-45 were considered by the Examiner in the Office Action. Claim 46 was withdrawn from consideration in a Reply to Restriction Requirement dated March 7, 2003.

Applicant has amended claims 9, 25, 39, 43, and 45. No new matter has been added by the amendments.

Reconsideration of this application in light of the following remarks is hereby respectfully requested.

Summary of the Examiner's Action

Claims 9, 25, 39 and 43 were objected to because in the phrase "a least a portion of the die paddle," "a least" is allegedly misspelled.

Claims 1, 2, 9, 15-17, 19-21, 23, 24, and 43-45 were rejected under 35 U.S.C. § 102(b) as being anticipated by Kinsman et al. U.S. Patent No. 6,075,283 (hereinafter "Kinsman").

Claims 3-8, 10-14, 18, and 22 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kinsman.

Claims 25-38 and 39-42 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to point out and distinctly claim the subject matter which applicant regards as the invention.

Applicant's Reply to the Objection to  
Claims 9, 25, 39 and 43

The Examiner objected to claims 9, 25, 39 and 43 because in the phrase "a least a portion of the die paddle," "a least" is allegedly misspelled. Applicant has amended claims 9, 25, 39 and 43 to correct this typographical error. Applicant has also similarly amended claim 45 to correct the same typographical error. Accordingly, applicant respectfully requests that the objection to claims 9, 25, 39 and 43 be withdrawn.

Applicant's Reply to the Rejection of Claims 1, 2, 9,  
15-17, 19-21, 23, 24 and 43-45 under 35 U.S.C § 102(b)

Claims 1, 2, 9, 15-17, 19-21, 23, 24, and 43-45 were rejected under 35 U.S.C. § 102(b) as being anticipated by Kinsman. The Examiner's rejections are respectfully traversed.

Applicant's Specific Remarks  
Regarding the Rejection of Claims 1 and 2

Applicant's invention, as defined by independent claim 1, is directed towards a leadframe for use in an integrated circuits package. The leadframe has a frame which is lying in a first plane. The frame is connected to one end of a plurality of leads lying substantially in the first plane, and a die paddle lying in a second plane which is substantially parallel to the first frame. The second plane, containing the die paddle is offset from the first plane by a given distance. Four support members connect the die paddle to the frame. The support members are substantially parallel to the end of the die paddle to which they are connected.

Kinsman refers to several embodiments of a leadframe for use in an integrated circuits package. The leadframe includes a frame and leads lying in a first plane and a die mounting paddle lying in a second plane, which is offset vertically from the first plane. The different embodiments described in Kinsman have slightly different configurations for the support members that connect the frame and the die mounting paddle, but they all show the support members "oriented along the longitudinal axis 50 of the die mounting paddle" (Kinsman, column 4, lines 10-11).

The Examiner asserts that Kinsman discloses in FIGS. 4-4B and 5-5C all of the elements of applicant's claim 1. Contrary to the Examiner's assertion, applicant respectfully submits that Kinsman does not show or suggest support members being "substantially parallel to the end of the die paddle to which they are connected" as defined in claim 1. In fact, Kinsman discloses the opposite. The support members of Kinsman are perpendicular to the end of the die paddle to which they are connected. This is shown on Kinsman's FIGS. 4-4B and 5-5C and the corresponding descriptions of these figures, which states that the support members of Kinsman are oriented along the longitudinal axis 50 of the die paddle. Since the longitudinal axis is perpendicular to the end of the die paddle, the support members of Kinsman are perpendicular to the end of the mounting paddle to which they are connected and not substantially parallel as required by applicant's claim 1.

Accordingly, for at least this reason, independent claim 1 is allowable over Kinsman and the rejections should be withdrawn. Claim 2 is also allowable because it depends from claim 1.

Applicant's Specific Remarks Regarding the Rejection of Claims 9, 15-17, 19-21, 23, and 24

Applicant's invention, as defined by independent claim 9, is directed towards a leadframe for an integrated circuit. The leadframe has a frame, having a plurality of sides defining an interior portion of the frame. At least a portion of the frame lies in an upper horizontal plane. There are a plurality of leads having one end connected to the frame and another end within the interior portion of the frame. A die paddle is positioned with at least a portion of it lying in a lower horizontal plane within the interior portion of the frame. A first support member connects the frame to the die paddle. The support member has one end attached to the frame and another end attached to the die paddle. A horizontal axis is defined as being perpendicular to the side of the frame to which the support member is attached. An offset angle of less than 45 degrees is formed between the support member and a vertical axis, projected onto a vertical plane that is parallel to the horizontal axis, wherein a positive angle corresponds to an extension of the support member towards the interior of the frame. Note that the vertical axis is perpendicular to the horizontal plane in which the frame lies.

The offset angle is of particular importance because it enables applicant's invention to achieve the novel feature of increasing die paddle area in comparison to other known lead frame constructions such as that referred to in Kinsman. That is, an offset angle of less than 45 degrees results in leadframes that have die paddles that are larger than that of previously produced leadframes.

The Examiner asserts that Kinsman discloses in Figs. 4-4B and 5-5C all of the elements of applicant's claim 9. Contrary to the Examiner's assertion, applicant respectfully submits that Kinsman does not show or suggest a support member with an offset angle of less than 45 degrees as required by applicant's claim 9.

In general, Kinsman refers to leadframes that are designed to avoid relatively large downsets. Kinsman teaches leadframe designs that avoid large downsets because large downsets are known to result in leadframes having die paddles that are not co-planer to the frame to which they are attached. In addition, leadframes that are constructed with large downsets interlock with other leadframes when stacked together and become difficult to separate.

Column 4, line 4 through column 6, line 13 and FIGS. 3-3B and 4-4B refer to leadframes that have a frame and a die paddle that are connected together with multiple downset segments. The multiple downset segments can be seen for example, in FIG. 4, which shows first downset segment 66A1 and second downset segment 66A2. As shown, both downsets are being used in conjunction with each other to connect one end of the die paddle to the frame. It is this dual downset segment configuration that enables the leadframes of Kinsman to avoid relatively large downsets.

While the multiple downset segments of Kinsman avoid the problems of large downsets, the multiplicity of these segments reduces the size of the die paddle. Applicant's invention, as described above, avoids shrinking die paddle size by using a line segment (not multiple downset segments) to connect the frame to the die paddle such that an offset angle of less than 45 degrees exists between the line

segment and a vertical axis that is perpendicular to the horizontal plane in which the frame lies.

Notwithstanding the structural differences and the advantages applicant's invention provides over the prior art, the Examiner contends that Kinsmen shows offset angles of less than 45 degrees. Referring to column 6, line 42 through column 7, line 7 and FIGS. 5A, 5B, and 5C, Kinsman shows downset segment angles (see A3 and A4 in FIGS. 5B and 5C) that exist between the plane of the connection segment (see connecting segment 68C in FIG. 5C) and downset segment (segment 62B1 in FIG. 5C). Kinsman states that the downset segment angles can range between 30 and 45 degrees (Kinsman, column 6, line 61). However, the downset angle described in Kinsman is not equivalent to applicant's offset angle as defined in claim 9. Applicant's offset angle exist between the line segment and a vertical axis that is perpendicular to the horizontal plane in which the frame lies. Kinsman's offset angle exist between a horizontal plane extending from one end of the connecting segment and the segment itself. In other words, if the offset angle of applicant's invention were applied to FIG. 5C, it would appear as the complement to angles A3 and A4 of Kinsman. Thus, the complement of A3 and A4 results in offset angles ranging from 45-60 degrees. This range of offset angles in Kinsman is greater, not less than 45 degrees as required by applicant's independent claim 9.

Therefore, Kinsman fails to show or suggest an offset angle between the first line segment and vertical axis, projected onto a first vertical plane that is parallel to the horizontal axis, that is less than 45 degrees.

Accordingly, for at least the reasons that Kinsman does not increase die paddle size based on its leadframe

geometry and that it does not show or suggest an offset angle of less than 45 degrees, independent claim 9 is allowable over Kinsman and the rejection should be withdrawn.

Dependent claims 15-17, 19-21, 23, and 24 are also allowable over Kinsman because they depend from claim 9.

Applicant's Specific Remarks  
Regarding the Rejection of Claims 43-45

Applicant's invention, as defined by independent claim 43, is directed towards an integrated circuit package which contains a frame which lies substantially in an upper horizontal plane. Attached to the frame are a plurality of leads which extend into the interior portion of the frame. A die paddle is also positioned within the interior portion of the frame, lying at least partially in a lower horizontal plane. An integrated circuit die having a plurality of bond pads on an active side is contained on the die paddle. A first support member connects the frame to the die paddle. Claim 43 has been amended to specify that the support member, when projected onto the horizontal plane, is substantially parallel to the side of the die paddle to which it connects. A bond wire electrically connects one of the bond pads on the integrated circuit die to the frame at some point on the upper horizontal frame.

Kinsman refers to several embodiments of a leadframe for which is constructed from a frame and leads in a first plane, a die mounting paddle in a second plane vertically offset from the first plane, and a bond wire that electrically connects a bond pad, on a die mounted on the die mounting paddle, to the frame. The different embodiments described in Kinsman have slightly different configurations

for the support members that connect the frame and the die mounting paddle, but they all show the support members "oriented along the longitudinal axis 50 of the die mounting paddle" (Kinsman, column 4, lines 10-11). This longitudinal axis referred to in Kinsman is perpendicular to the side of the die paddle to which it connects. Therefore, as described above, Kinsman fails to show or suggest a first support member that is substantially parallel to the first side of die paddle to which it is connected, as defined by claim 43.

Accordingly, for at least the foregoing reason, claim 43 is allowable over Kinsman and the rejection should be withdrawn. Claim 44 is allowable because it depends from claim 43.

Applicant's invention, as defined by independent claim 45, is directed towards a leadframe for an integrated circuit. The leadframe is made up of a frame, defining an interior portion, which lies partially in an upper horizontal plane. Attached to the frame are a plurality of leads which extend into the interior portion of the frame. A die paddle is also positioned within the interior portion of the frame, lying at least partially in a lower horizontal plane. A pair of support members connect the frame to the die paddle. The pair of support members are oriented such that the support members extend away from a vertical plane that is perpendicular to the frame and that passed between the support members.

Kinsman refers to several embodiments of a leadframe, which is constructed from a frame and leads in a first plane and a die mounting paddle in a second plane vertically offset from the first plane. The different embodiments described in Kinsman have slightly different

configurations for the support members that connect the frame and the die mounting paddle, but none of the support members extend away from a vertical plane that passes between the support members, as defined by claim 45. Rather, the support members of Kinsman extend adjacent to a vertical plane perpendicular to the frame, as evidenced by the fact that the support members are "oriented along the longitudinal axis 50 of the die mounting paddle" (Kinsman, column 4, lines 10-11). Therefore, the support members of Kinsman are not arranged in the same structural configuration as defined by applicants claim 45.

Accordingly, for at least the foregoing reason, claim 45 is allowable over Kinsman and the rejection should be withdrawn.

Applicant's Reply to the Rejection of  
Claims 3-8, 10-14, 18 and 22 under 35 U.S.C § 103(a)

The Examiner rejected claims 3-8 under 35 U.S.C § 103(a) as being unpatentable over Kinsman. The Examiner's rejection is respectfully traversed. Because applicant has demonstrated in the foregoing that independent claim 1 is allowable, dependent claims 3-8 are also allowable and the rejection should be withdrawn.

The Examiner rejected claims 10-14, 18 and 22 under 35 U.S.C § 103(a) as being unpatentable over Kinsman. The Examiner's rejection is respectfully traversed. Because applicant has demonstrated in the foregoing that independent claim 9 is allowable, dependent claims 10-14, 18 and 22 are also allowable and the rejection should be withdrawn.

Applicant's Reply to the Rejection of  
Claims 25-38 and 39-42 under 35 U.S.C § 112

Claims 25-38 and 39-42 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to point out and distinctly claim the subject matter which applicant regards as the invention.

The Examiner contends that the feature "the offset angle" in "the offset angle between the first line segment and the vertical axis," recited in claim 25 has insufficient antecedent basis. Applicant has amended claim 25 to change the feature to "an offset angle." Accordingly, claim 25 complies with the requirements of 35 U.S.C. § 112 and is therefore allowable and the rejection should be withdrawn. Because application has demonstrated in the foregoing that independent claim 25 is allowable, dependent claims 26-30 and 31-38 should be allowable.

Applicant also submits that claims 25-38 are allowable over Kinsman because, as described above, Kinsman does not show or suggest an offset angle between the first line segment and the vertical axis that is less than 45 degrees as defined in independent claim 25.

The Examiner contends that the feature "the offset" in "wherein the offset between the die and the frame," recited in claim 39 has insufficient antecedent basis. Applicant has amended claim 39 to change the feature to "an offset." Accordingly, claim 39 complies with the requirements of 35 U.S.C. § 112 and is therefore allowable and the rejection should be withdrawn. Because application has demonstrated in the foregoing that independent claim 39 is allowable, dependent claims 40-42 should be allowable.

Applicant also submits that claims 39-42 are allowable over Kinsman because Kinsman does not show or suggest an offset angle between the die and the frame, as projected on to a horizontal axis, that is less than 4 mils, as defined in claim 39.

Conclusion

For at least the foregoing reasons, applicant respectfully submits that claims 1-45 are allowable. This application is therefore in condition for allowance. Reconsideration and allowance of this application are accordingly respectfully requested.

Respectfully submitted,



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